

Claims

- [c1] An electrophoretic display comprising:
 - a light-transmissive front substrate;
 - a rear substrate spaced from the front substrate so as to leave at least one sealed cavity therebetween; and
 - an electrophoretic medium disposed in the at least one sealed cavity, the electrophoretic medium comprising a liquid and a plurality of capsules suspended in the liquid, each of the capsules comprising a capsule wall, a suspending fluid held within the capsule wall and at least one electrically charged particle suspended in the suspending fluid so as to be capable of moving therethrough on application of an electric field to the electrophoretic medium.
- [c2] An electrophoretic display according to claim 1 wherein at least one of the front and rear substrates is provided with an electrode arranged to apply an electric field to the electrophoretic medium.
- [c3] An electrophoretic display according to claim 2 wherein the front substrate is provided with a single electrode extending across the display, and the rear electrode is provided with a plurality of discrete electrodes.

- [c4] An electrophoretic display according to claim 1 wherein the liquid has substantially the same composition as the suspending fluid.
- [c5] An electrophoretic display according to claim 4 wherein the liquid and the suspending fluid both comprise a hydrocarbon solvent, or a mixture of a hydrocarbon solvent and a halocarbon.
- [c6] An electrophoretic display according to claim 1 wherein the liquid has a greater viscosity than the suspending fluid.
- [c7] An electrophoretic display according to claim 1 wherein the liquid is substantially iso-osmotic with the suspending fluid.
- [c8] An electrophoretic display according to claim 1 wherein the liquid is essentially free from polymerizable species.
- [c9] An electrophoretic display according to claim 1 wherein each of the capsules comprises at least one first type of electrically charged particle suspended in the suspending fluid and at least one second type of electrically charged particle suspended in the suspending fluid, the second type of particle having at least one optical characteristic differing from that of the first type of particle, the sec-

ond type of particle also having an electrophoretic mobility differing from that of the first type of particle.

- [c10] An electrophoretic display according to claim 9 wherein the first and second types of particles bear charges of opposite polarities.
- [c11] An electrophoretic medium comprising a liquid and a plurality of capsules suspended in the liquid, each of the capsules comprising a capsule wall, a suspending fluid held within the capsule wall and at least one electrically charged particle suspended in the suspending fluid so as to be capable of moving therethrough on application of an electric field to the electrophoretic medium, the liquid being essentially free from polymerizable species.
- [c12] An electrophoretic medium according to claim 11 wherein the liquid has substantially the same composition as the suspending fluid.
- [c13] An electrophoretic medium according to claim 11 wherein the liquid has a greater viscosity than the suspending fluid.
- [c14] An electrophoretic medium display according to claim 11 wherein the liquid is substantially iso-osmotic with the suspending fluid.

- [c15] A process for forming an electrophoretic display, which process comprises:
 - providing a front light-transmissive substrate and a rear substrate spaced from the front substrate so as to leave at least one cavity therebetween, at least one of the front and rear substrates having walls defining an aperture connecting the at least one cavity to the exterior surface of at least one of the front and rear substrates;
 - providing an electrophoretic medium comprising a liquid and a plurality of capsules suspended in the liquid, each of the capsules comprising a capsule wall, a suspending fluid held within the capsule wall and at least one electrically charged particle suspended in the suspending fluid so as to be capable of moving therethrough on application of an electric field to the electrophoretic medium; and
 - introducing the electrophoretic medium via the aperture into the at least one cavity.
- [c16] A process according to claim 15 wherein, after the electrophoretic medium has been introduced into the at least one cavity, the aperture is sealed.
- [c17] A process according to claim 15 wherein, prior to the introduction of the electrophoretic medium, the at least one cavity is substantially evacuated, and the introduction of the electrophoretic medium into the at least one

cavity is effected by contacting the aperture with a quantity of the electrophoretic medium under a pressure greater than that in the substantially evacuated at least one cavity.

- [c18] An optical switch comprising:
 - a cladding;
 - a core having an external surface, a first portion of the external surface being covered by the cladding and a second portion of the external surface not being covered by the cladding; and
 - an electrophoretic medium in contact with the second portion of the external surface, the electrophoretic medium comprising a suspending fluid and a plurality of electrically charged particles suspended in the suspending fluid and capable of moving therethrough on application of an electric field to the electrophoretic medium, the particles having a refractive index differing from that of the suspending fluid.
- [c19] An optical switch according to claim 18 wherein the core has substantially the form of a polygonal prism and the second portion of the external surface comprises one of the flat faces of the polygonal prism.
- [c20] An optical switch according to claim 18 further comprising means for applying an electric field to the elec-

trophoretic medium, the electric field means being arranged to move the particles between a first position, in which the particles lied adjacent the second portion of the external surface of the core, and a second position, in which the particles are spaced from the second portion of the external surface, the refractive indices of the particles and the suspending fluid being arranged so that in one of the first and second positions light passing along the core passes into the electrophoretic medium and in the other of the first and second positions light passing along the core remains within the core.

- [c21] An optical switch according to claim 18 further comprising means for applying an electric field to the electrophoretic medium, the electric field means being arranged to move the particles between a first position, in which the particles lied adjacent the second portion of the external surface of the core, and a second position, in which the particles are spaced from the second portion of the external surface, the refractive indices of the particles and the suspending fluid being arranged so that in both the first and second positions light passing along the core remains within the core, but that transition from the first to the second position causes a phase shift in the light.

[c22] An optical switch comprising:
a waveguide having walls defining a cavity therein;
an electrophoretic medium disposed within the cavity,
the electrophoretic medium comprising a suspending
fluid and a plurality of electrically charged particles sus-
pended in the suspending fluid and capable of moving
therethrough on application of an electric field to the
electrophoretic medium, the particles having a dielectric
constant differing from that of the suspending fluid; and
at least one electrode disposed adjacent the cavity and
arranged to apply an electric field to the electrophoretic
medium, thereby moving the particles between a first
position, in which the particles obstruct transmission of
light through the cavity, and a second position, in which
the particles permit transmission of light through the
cavity.

[c23] An electrophoretic display comprising:
a light-transmissive front substrate;
a rear substrate spaced from the front substrate so as to
leave a cavity therebetween, the cavity having a front
wall adjacent the front substrate, a rear wall adjacent the
rear substrate and at least one side wall extending from
the front wall to the rear wall;
an electrophoretic medium disposed within the cavity,
the electrophoretic medium comprising a suspending

fluid and a plurality of electrically charged particles suspended in the suspending fluid and capable of moving therethrough on application of an electric field to the electrophoretic medium;

at least one electrode disposed on the at least one side wall of the cavity; and

means for applying a voltage to the at least one electrode and thereby moving the particles between a first position, in which the particles are dispersed through the cavity, thereby preventing light from passing through the cavity, and a second position, in which the particles lie adjacent the at least one electrode, thereby permitting light to pass through the cavity.